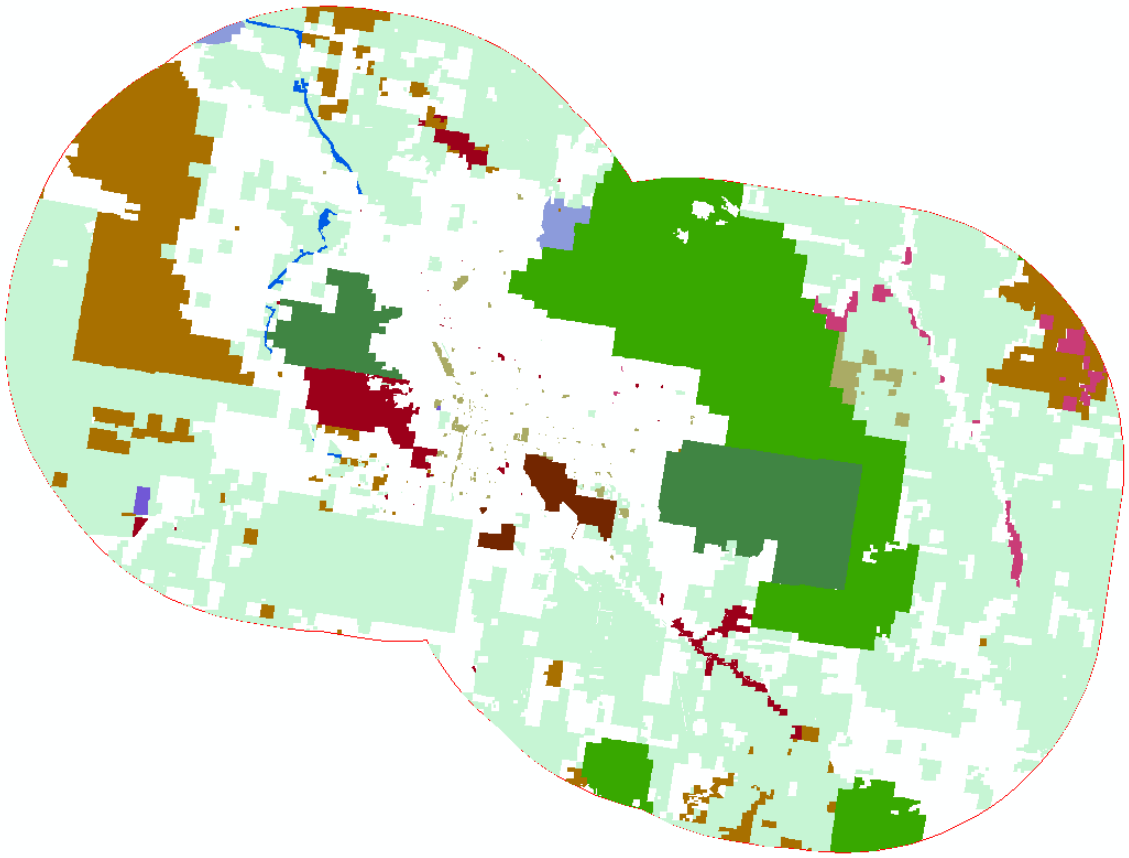
National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

NOTE: There may be revised processes and documentation available.

Check the NPScape methods webpage
(http://science.nature.nps.gov/im/monitor/npscape/methods.cfm)
for the most current version.

NPScape Standard Operating Procedure: Conservation Status Measure – Protected Area and Ownership/Governance



Suggested Citation: National Park Service. 2013. NPScape Standard Operating Procedure: Conservation Status Measure – Protected Area and Ownership/Governance. Version 2014-01-06. National Park Service, Natural Resource Stewardship and Science. Fort Collins, Colorado.

Contents

Version History		
Version	Update Date	Changes
20130114	20130114	Initial re-draft
20130222	20130222	Updated to reflect recent release of PAD-US version 1.3; appendices added to better describe how other local sources of protected areas data can be pre-processed and used with this tool.
20130315	20130315	Note added regarding an issue in Geoprocessing Options between ArcMap 10.0 and 10.1 that could cause a script to fail in 10.1
20131223	20131223	Tool optimized for use with ArcMap 10.1, tested for use with 10.2

Overview

NPScape is a landscape dynamics monitoring project that provides landscape-level data, tools, and evaluations for natural resource management, planning, and interpretation (NPS 2013). This standard operating procedure (SOP) provides guidance on how to calculate NPScape area protected (CAP) and ownership/governance (COW) metrics. These metrics are derived from one of three tool input sources: the version 1.3 PAD-US geodatabase (PADUS1_3.gdb) feature class named PADUS1_3 (USGS National Gap Analysis Program 2012), the World Database of Protected Areas (WDPA) (World Commission on Protected Areas 2011) and the Marine Protected Areas (MPA) database (National Marine Protected Areas Center 2011). Download the tool(s) and a copy of this SOP here:
http://science.nature.nps.gov/im/monitor/npscape/methods.cfm.

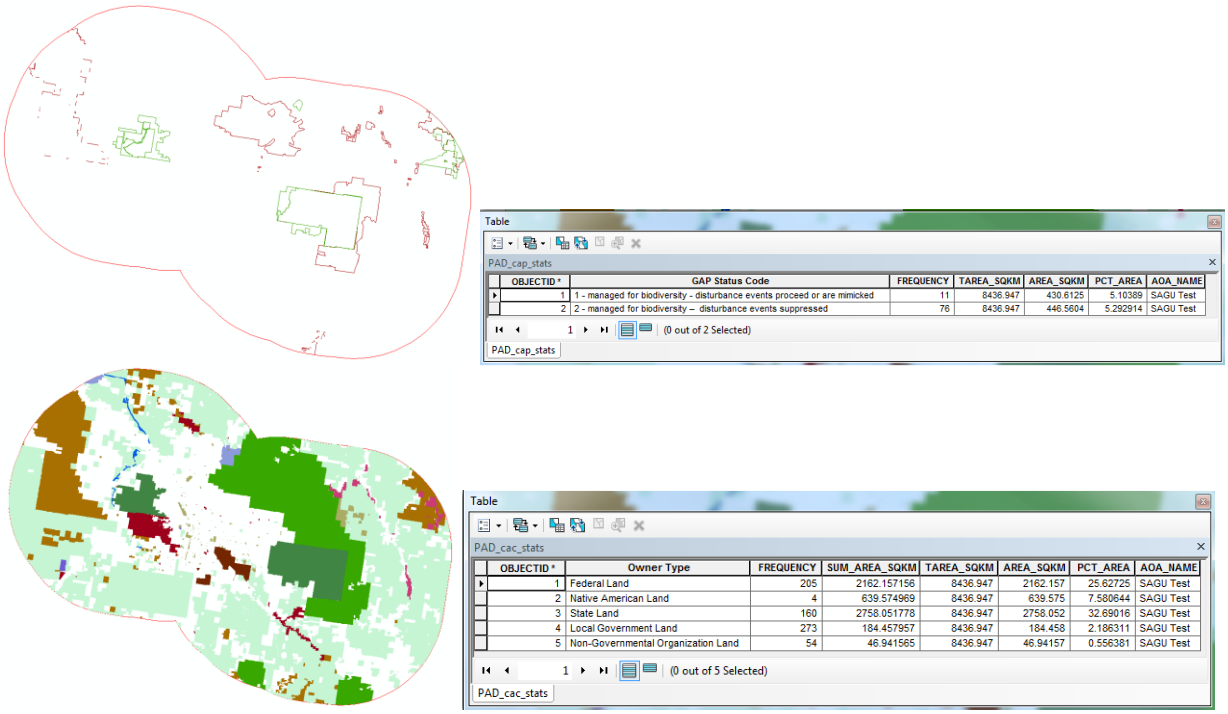
The zip file includes an ArcGIS™ toolbox containing NPScape conservation status script tools, an ArcGIS™ layer files for displaying outputs, and a copy of this SOP document. The tool inputs for can be downloaded from either the USGS GAP web page or the NPScape data page (see Data Requirements section below).

The purpose of this SOP is threefold. First, because these directions were followed in the processing of the NPS datasets, it provides detailed documentation on the methodology used by NPScape to calculate protected area and ownership/governance metrics for the Conservation Status measure. Second, this SOP provides any user with the ability to replicate the creation of these data for custom areas of analysis. Finally, if an I&M park or network has a need to analyze protected area data other than PAD-US, WDPA, or MPA, this SOP provides a processing template for recalculating focal metrics associated with the Conservation Status measure.

The Protected Areas Database (PAD-US) 1.3 tool input, PADUS1_3, is a polygon feature class of protected areas (USGS National Gap Analysis Program 2012). PAD-US 1.3 was updated in the winter of 2012 by the USGS Gap Analysis Program and includes NPS administrative tract polygons (where available) or legacy NPS administrative boundary polygons where NPS tract data were not present. The NPScape project extracted and pre-processed the PADUS 1.3 features for an area extending from Mexico to the Arctic plus the outlying Pacific and Caribbean islands. The WDPA dataset is a polygon feature class of protected areas. The NPScape project extracted and pre-processed the area extending from Mexico to the Arctic plus the outlying Pacific and Caribbean islands. The Marine Protected Areas (MPA) dataset is a polygon feature class of protected areas extending from Mexico to the Arctic. The outlying Pacific and Caribbean islands are also included.

Outputs include two clipped polygon feature classes and summary tables with percent area protected and percent ownership category values.

- File Geodatabase (ESRI® format) with 2 metric feature classes and statistics tables:
  - protected areas metric: CAP and CAP_stats
  - ownership category metric: COW and COW_stats



Table

PAD_cap_stats

OBJECTID *	GAP Status Code	FREQUENCY	TAREA_SQKM	AREA_SQKM	PCT_AREA	AOA_NAME
1	1 - managed for biodiversity - disturbance events proceed or are mimicked	11	8436.947	430.6125	5.10389	SAGU Test
2	2 - managed for biodiversity – disturbance events suppressed	76	8436.947	446.5604	5.292914	SAGU Test

(0 out of 2 Selected)

PAD_cap_stats

Table

PAD_cac_stats

OBJECTID *	Owner Type	FREQUENCY	SUM_AREA_SQKM	TAREA_SQKM	AREA_SQKM	PCT_AREA	AOA_NAME
1	Federal Land	205	2162.157156	8436.947	2162.157	25.62725	SAGU Test
2	Native American Land	4	639.574969	8436.947	639.575	7.580644	SAGU Test
3	State Land	160	2758.051778	8436.947	2758.052	32.69016	SAGU Test
4	Local Government Land	273	184.457957	8436.947	184.458	2.186311	SAGU Test
5	Non-Governmental Organization Land	54	46.941565	8436.947	46.94157	0.556381	SAGU Test

(0 out of 5 Selected)

PAD_cac_stats

Example PAD_CAP and PAD_COW feature classes and statistics tables for an AOA at Saguaro National Park.

Using an ArcGIS™ toolbox, processing steps include specifying the attribute field from which the protected area status and ownership type values are derived and clipping the tool input protected area and ownership type polygons to the area of interest (AOA). Area summary attributes are added to the output feature classes and summary statistics tables. Output features are displayed with NPScape default symbology using an ArcGIS layer file. Any AOA polygon can be used as long as its spatial reference matches that of the tool input dataset.

This SOP may be used with other (non-PADUS, non-WDPA, non-MPA) protected areas/ownership type tool input data if specific criteria are met. See Appendix 2 for details.

For ecological guidance on using and interpreting these metrics, see the NPScape Interpretive Guide (Monahan et al. 2012).

Software Requirements

ArcGIS software is required to generate the metric outputs. The data sources and tools used are assumed to be in ESRI ArcGIS™ format, version 10 Service Pack 5 or higher.

Data Requirements

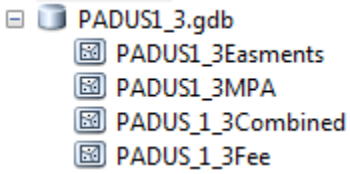
The NPScape project provides three protected area/ownership tool input datasets which can be used with the processing tools.

Protected Areas Database of the United States (USGS National Gap Analysis Program 2012) or alternative

PADUS1_3.gdb/PADUS1_3Combined

http://gapanalysis.usgs.gov/padus/data/download/

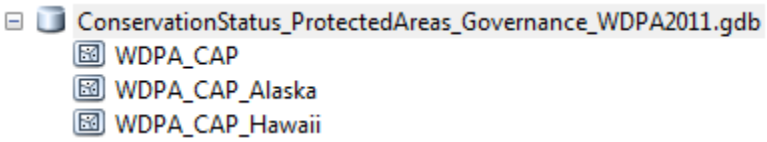
If you are a NPS user, you can contact the NPScape team to request a custom clipped extent: mailto:NRSS_NRPC_NPScape@nps.gov



This polygon feature class includes protected area features from the U.S. including Alaska and the outlying islands.

Note: PADUS1.3 data acquired from the GAP Analysis program MUST be repaired before using in the NPScape tool. **Use the ArcGIS Repair Geometry tool to correct spatial errors in the PADUS1_3Combined feature class**

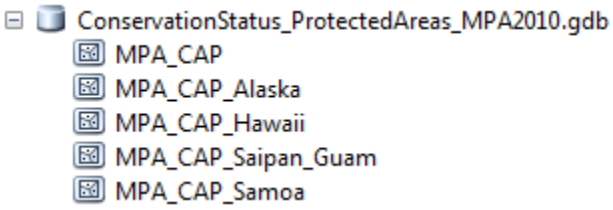
NPScape pre-processed tool input version of World Database of Protected Areas (2011)
ConservationStatus_ProtectedAreas_Governance_WDPA2011.gdb\WDPA_CAP:
https://irma.nps.gov/App/Reference/Profile/2184566



For Governance calculations and displays, the WDPA GOV_TYPE attribute was reclassified to populate the OWNER attribute. See Appendix 6 for details.
This polygon feature class includes protected area features from the U.S. including Alaska and the outlying islands, Mexico, and Canada. Separate feature classes are available for Alaska, Hawaii, Guam, Samoa, and Puerto Rico and the Virgin Islands.

If you are a NPS user, you can contact the NPScape team to request a custom clipped extent: mailto:NRSS_NRPC_NPScape@nps.gov

NPScape pre-processed tool input version of National Marine Protected Areas Center Marine Protected Areas Inventory (2010)
ConservationStatus_ProtectedAreas_MPA2010.gdb\MPA_CAP:
https://irma.nps.gov/App/Reference/Profile/2184566



This polygon feature class includes marine protected area features from the U.S. including outlying islands. This version of the MPA Inventory contains geospatial boundaries for 1214 of the 1619 identified marine protected areas and is considered complete as of January 2010. The feature class' native spatial reference is WGS84 (geographic). The dataset was re-projected to the NPScape standard projection. Polygons with a Prot_Lvl value of 'To Be Determined' and a Mgmt_Plan value that was null or that was equal to 'Community Agreement' or 'Not Management Plan' were excluded. See Appendix 6 for details. Separate feature classes are available for Alaska, Hawaii, and Puerto Rico and the Virgin Islands.

If you are a NPS user, you can contact the NPScape team to request a custom clipped extent: mailto:NRSS_NRPC_NPScape@nps.gov

Refer to the Frequently Asked Questions section for other data access options.

For local analyses, parks may have access to more detailed, current, and/or accurate protected area and ownership data. The ProtectedAreaDatabaseUS_Metrics tool can be run with these local data. See Appendix 2 - Using custom AOAs and/or local input data section for tips on using a local tool input.

Area of Analysis polygon

AOA polygons for boundaries and 3km and 30km buffers of parks, CEC ecoregions, FWS LCC polygons, and upstream watersheds (for selected parks) are available as NPScape datasets: http://science.nature.nps.gov/im/monitor/npscape/methods.cfm

Alternatively, user-defined AOA polygons can be used if they conform to the input spatial reference.

Input data spatial reference

The NPScape project uses USA Contiguous Albers Equal Area Conic USGS as its standard spatial reference. A local (i.e. custom, non-NPScape sourced) area of analysis polygon may be used if its spatial reference matches the NPScape-provided or local tool input vector data. In this scenario, re-project your local AOA data (if necessary) and run repair geometry on it before running the tool(s). See the Frequently Asked Questions section for more details on re-projecting tool outputs or tool inputs.

Input Data Pre-Processing

Determine AOA polygon

If using an NPScape-sourced AOA, download the appropriate AOA geodatabase from the link in the previous section.

Re-project user-defined input datasets (if needed)

All user-defined, custom, non-NPScape sourced tool inputs (e.g. AOA polygon) must be in the USA Contiguous Albers Equal Area Conic USGS spatial reference if used with NPScape-sourced tool inputs.

1. Open ArcCatalog or ArcMap. Click the search button and search for 'Project'. Open the Project tool and re-project your data to USA Contiguous Albers Equal Area Conic USGS.
2. Search for 'Repair Geometry' and run that tool on your re-projected dataset.
3. See the Frequently Asked Questions section for more details.

Download tool input data

If using NPScape or GAP provided tool inputs, download the dataset(s) from the links in the Data Requirements section. PADUS 1.3 data acquired from the GAP Analysis program MUST be repaired before using in the NPScape tool.

Run NPScape ConservationStatus Protected Area Database US Metrics tool

Note: The example below is illustrated using PAD version 1.2, which has been surpassed by version 1.3; the same processing steps have been successfully tested against PAD version 1.3.

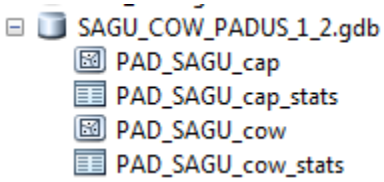
Before using the tool with PADUS1.3 input data, use the ArcGIS Repair Geometry tool to correct spatial errors in the PADUS1_3Combined feature class.

The Protected Area Database tool outputs protected area and ownership type feature classes and summary statistics tables for an area of analysis:

- PAD_CAP: protected areas feature class

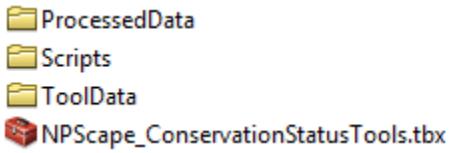
- PAD_COW: ownership/governance type feature class
- PAD_CAP_stats: protected areas summary statistics table
- PAD_COW_stats: ownership/ governance type summary statistics table

Example tool outputs:



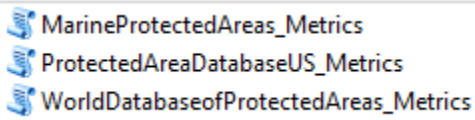
Add toolbox to ArcMap

1. Check Geoprocessing Options settings: Geoprocessing → Geoprocessing Options → 'Overwrite the Outputs of Geoprocessing Operations' should be checked. This addresses an issue in ArcGIS 10.1 Service Pack 1 when using feature layers.
2. Extract the tools zip file downloaded from the methods link in the Overview section above. The following folder structure will be created:



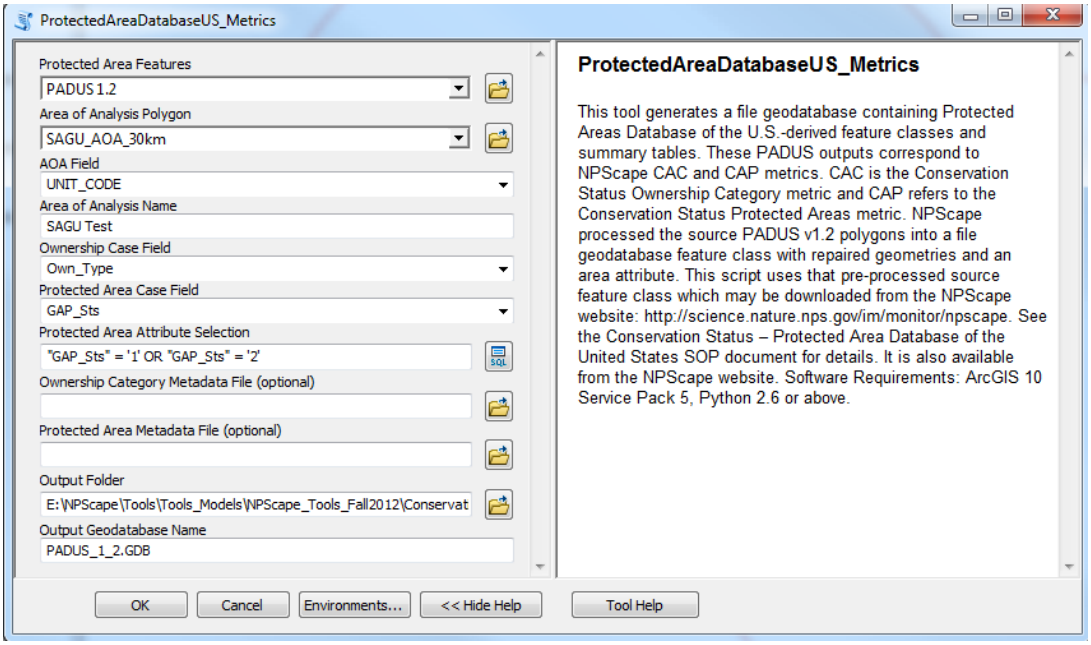
ProcessedData contains ArcMap layer files and is the default tool output folder. Scripts contains the Python code used by the NPScape_ConservationStatusTools.tbx toolbox.

3. Open ArcMap use the Catalog window to navigate to the folder where the tools were extracted. Open the NPScape_ConservationStatusTools.tbx toolbox.
4. Double-click on the ProtectedAreasDatabaseUS_Metrics tool to open it.



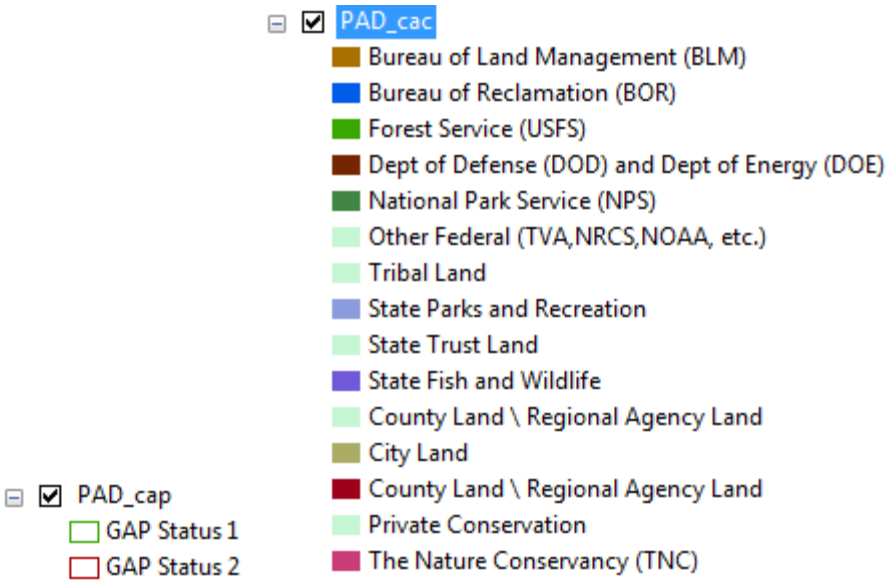
Run the Protected Area Database US Metrics Tool

1. Add input data to the map:
   - Area of analysis feature class; if this is a multi-part feature class, summary area will be the total area of all parts, unless one or more individual features is selected
   - Tool input data: PADUS_1_3.gdb/PADUS1_3 or local protected area/ownership type features (see Appendix 3 - Using custom AOAs and/or local input data section for tips on using a tool input other than PADUS).
2. Populate values for each of the required parameters in the tool:



Protected Area Features: PADUS1_3.gdb/PADUS1_3Combined or local protected area/ownership type feature class
Area of Analysis Polygon: feature class used as area of analysis
AOA Field: Text format attribute from Area of Analysis Polygon. Used to label output rasters and tables for multi-feature AOAs. If AOA polygon is a single feature, only one output raster and output table will be generated.
Area of Analysis Name: Area of analysis name. For example, ROMO or Upper Lost Creek Watershed. This value is copied to all output feature classes and summary table
Ownership/Governance Case Field: attribute in protected area feature class containing ownership type
Protected Area Case Field: attribute in protected area feature class containing protected area type
Protected Area Attribute Selection: SQL statement used to filter protected area type; defaults to "GAP_Sts" = '1' OR "GAP_Sts" = '2' for PADUS feature class
Ownership Category Metadata File (optional): XML format (FGDC) metadata for output ownership feature class and table
Protected Area Metadata File (optional): XML format (FGDC) metadata for output protected area feature class and table
Output Folder: Output folder for file geodatabase. Defaults to ProcessedData subfolder. You must have write permission to this folder.
Output Geodatabase Name: File name for output file geodatabase (v10.x); must end in '.gdb'
Note: if the geodatabase already exists, feature classes and the table will be overwritten

3. Depending on the extent of the AOA feature class, the tool may take several minutes to run. Processing status will display in ArcMap, either as a popup or as a message in the geoprocessing background bar. The full tool summary is found in the ArcMap → Geoprocessing → Results popup, including error messages.
4. The CAP and COW feature classes and summary statistics tables will be added automatically to the map. If single-part AOA polygons were used, only the raster and statistics table for the last feature will be added to the map. Other output feature classes and tables can be added manually and symboloized with the *.lyr files in the ProcessedData subfolder. Default symbology is thematic classes for protected area type and ownership type:



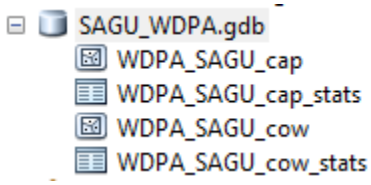
5. See tables in the Interpretation Tips section for a description of attributes in the output feature classes and statistics table.
6. Running the tool again: open Geoprocessing → Results. Double-click on the ProtectedAreasDatabaseUS_Metrics tool name to open the tool dialog. Change parameters as needed. Change the output geodatabase name if you don't want your original output over-written.

Run NPScape ConservationStatus World Database of Protected Area Metrics tool

The World Protected Area Database tool outputs protected area and ownership type feature classes and summary statistics tables for an area of analysis:

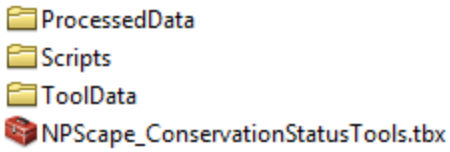
- WDPA_CAP: protected areas feature class
- WDPA_COW: governance type feature class
- WDPA_CAP_stats: protected areas summary statistics table
- WDPA_COW_stats: governance type summary statistics table

Example tool outputs:



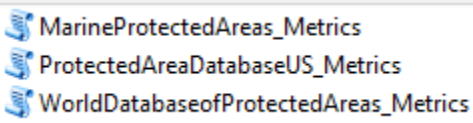
Add toolbox to ArcMap

5. Check Geoprocessing Options settings: Geoprocessing → Geoprocessing Options → 'Overwrite the Outputs of Geoprocessing Operations' should be checked. This addresses an issue in ArcGIS 10.1 Service Pack 1 when using feature layers.
6. Extract the tools zip file downloaded from the methods link in the Overview section above. The following folder structure will be created:



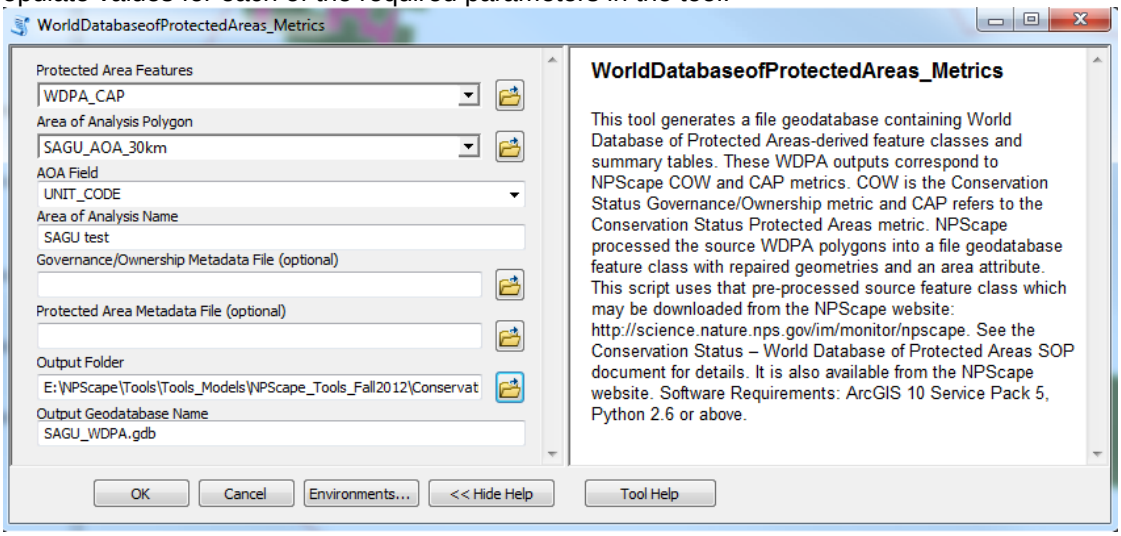
ProcessedData contains ArcMap layer files and is the default tool output folder. Scripts contains the Python code used by the NPScape_ConservationStatusTools.tbx toolbox.

7. Open ArcMap use the Catalog window to navigate to the folder where the tools were extracted. Open the NPScape_ConservationStatusTools.tbx toolbox.
8. Double-click on the WorldDatabaseofProtectedAreasDatabaseUS_Metrics tool to open it.



Run the World Protected Area Database US Metrics Tool.

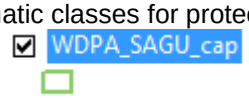
7. Add input data to the map:
   - Area of analysis feature class; if this is a multi-part feature class, summary area will be the total area of all parts, unless one or more individual features is selected
   - Tool input data: ConservationStatus_ProtectedAreas_Governance_WDPA2011.gdb\WDPA_CAP or local protected area/ownership type features (see Appendix 3 - Using custom AOAs and/or local input data section for tips on using a tool input other than PADUS).
8. Populate values for each of the required parameters in the tool:



Protected Area Features:
ConservationStatus_ProtectedAreas_Governance_WDPA2011.gdb\WDPA_CAP or local protected area/ownership type feature class
Area of Analysis Polygon: feature class used as area of analysis
AOA Field: Text format attribute from Area of Analysis Polygon. Used to label output rasters and tables for multi-feature AOAs. If AOA polygon is a single feature, only one output raster and output table will be generated.
Area of Analysis Name: Area of analysis name. For example, ROMO or Upper Lost Creek Watershed. This value is copied to all output feature classes and summary table
Governance/Ownership Category Metadata File (optional): XML format (FGDC) metadata for output ownership feature class and table
Protected Area Metadata File (optional): XML format (FGDC) metadata for output protected area feature class and table

Output Folder: Output folder for file geodatabase. Defaults to ProcessedData subfolder. You must have write permission to this folder.
Output Geodatabase Name: File name for output file geodatabase (v10.x); must end in '.gdb'
Note: if the geodatabase already exists, feature classes and the table will be overwritten

9. Depending on the extent of the AOA feature class, the tool may take several minutes to run. Processing status will display in ArcMap, either as a popup or as a message in the geoprocessing background bar. The full tool summary is found in the ArcMap → Geoprocessing → Results popup, including error messages.
10. The CAP and COW feature classes and summary statistics tables will be added automatically to the map. If single-part AOA polygons were used, only the raster and statistics table for the last feature will be added to the map. Other output feature classes and tables can be added manually and symboloized with the *.lyr files in the ProcessedData subfolder. Default symbology is thematic classes for protected area type and ownership type:



WDPA Governance (COW) symbology varies by feature content

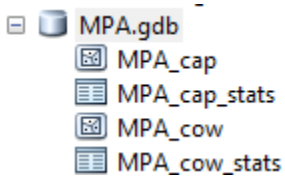
11. See tables in the Interpretation Tips section for a description of attributes in the output feature classes and statistics table.
12. Running the tool again: open Geoprocessing → Results. Double-click on the ProtectedAreasDatabaseUS_Metrics tool name to open the tool dialog. Change parameters as needed. Change the output geodatabase name if you don't want your original output over-written.

Run NPScape ConservationStatus Marine Protected Area Metrics tool

The Marine Protected Area tool outputs protected area and ownership type feature classes and summary statistics tables for an area of analysis:

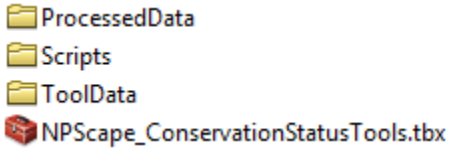
- MPA_CAP: protected areas feature class
- MPA_COW: governance type feature class
- MPA_CAP_stats: protected areas summary statistics table
- MPA_COW_stats: governance type summary statistics table

Example tool outputs:



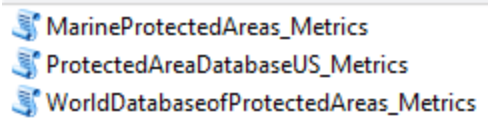
Add toolbox to ArcMap

9. Check Geoprocessing Options settings: Geoprocessing → Geoprocessing Options → 'Overwrite the Outputs of Geoprocessing Operations' should be checked. This addresses an issue in ArcGIS 10.1 Service Pack 1 when using feature layers.
10. Extract the tools zip file downloaded from the methods link in the Overview section above. The following folder structure will be created:



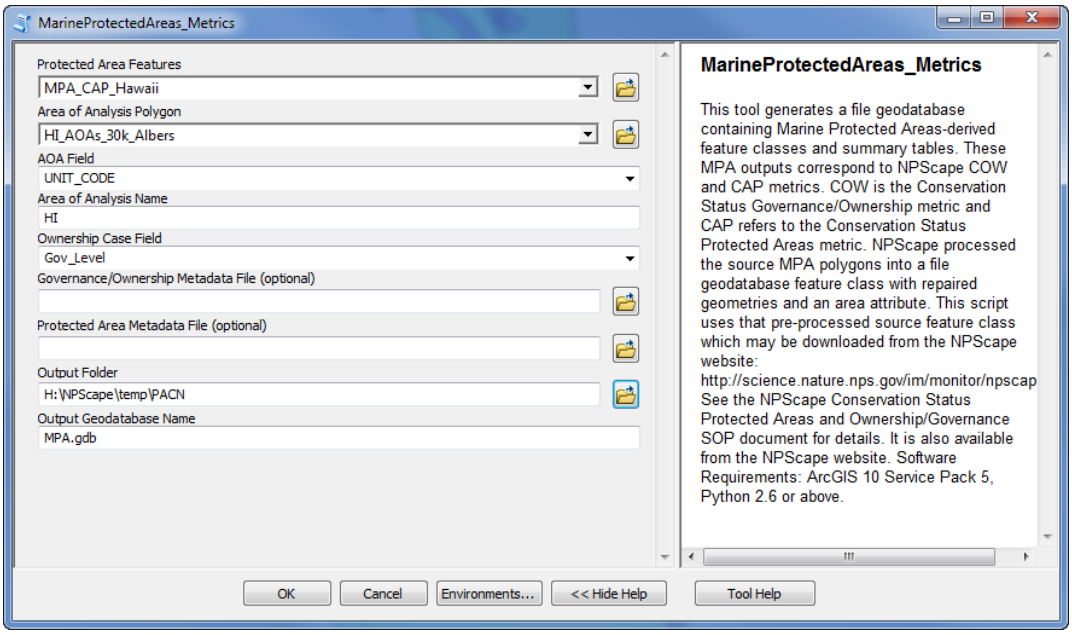
ProcessedData contains ArcMap layer files and is the default tool output folder. Scripts contains the Python code used by the NPScape_ConservationStatusTools.tbx toolbox.

11. Open ArcMap use the Catalog window to navigate to the folder where the tools were extracted. Open the NPScape_ConservationStatusTools.tbx toolbox.
12. Double-click on the MarineProtectedAreas_Metrics tool to open it.



Run the Marine Protected Metrics Tool

13. Add input data to the map:
    - Area of analysis feature class; if this is a multi-part feature class, summary area will be the total area of all parts, unless one or more individual features is selected
    - Tool input data: ConservationStatus_ProtectedAreas_MPA2010.gdb\MPA_CAP or local protected area/ownership type features (see Appendix 3 - Using custom AOAs and/or local input data section for tips on using a tool input other than PADUS).
14. Populate values for each of the required parameters in the tool:



Protected Area Features:
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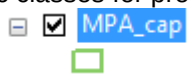
Governance/Ownership Category Metadata File (optional): XML format (FGDC) metadata for output ownership feature class and table
Protected Area Metadata File (optional): XML format (FGDC) metadata for output protected area feature class and table
Output Folder: Output folder for file geodatabase. Defaults to ProcessedData subfolder. You must have write permission to this folder.
Output Geodatabase Name: File name for output file geodatabase (v10.x); must end in '.gdb'

Note: if the geodatabase already exists, feature classes and the table will be overwritten

15. Depending on the extent of the AOA feature class, the tool may take several minutes to run. Processing status will display in ArcMap, either as a popup or as a message in the geoprocessing background bar. The full tool summary is found in the ArcMap → Geoprocessing → Results popup, including error messages.
16. The CAP and COW feature classes and summary statistics tables will be added automatically to the map. If single-part AOA polygons were used, only the raster and statistics table for the last feature will be added to the map. Other output feature classes and tables can be added manually and symboloized with the *.lyr files in the ProcessedData subfolder. Default symbology is thematic classes for protected area type and ownership type:



MPA Governance (COW) symbology varies by feature content

17. See tables in the Interpretation Tips section for a description of attributes in the output feature classes and statistics table.
18. Running the tool again: open Geoprocessing → Results. Double-click on the ProtectedAreasDatabaseUS_Metrics tool name to open the tool dialog. Change parameters as needed. Change the output geodatabase name if you don't want your original output over-written.

Quality Control

Verify dataset outputs

1. Verify that the output feature classes and summary statistics table were created and that the Onwer Type (or local tool input ownership type attribute) or GAP Status Code (or local tool input protected area attribute), AOA_NAME, and AREA_SQKM attributes are present in the feature class attribute tables. Also verify that the AOA_FEATURE_AREA_SQKM, AREA_SQKM, PCT_AREA, and AOA_NAME fields are present in the statistics tables.
2. Verify that feature class edges align correctly and that the polygon features align from feature class to feature class. Use the Effects → Swipe tool to help verify this. Note that the NPScape layer files for conservation status (ConservationStatus_Tools\ProcessedData*.lyr) are used to standardize the polygon symbology.
3. Look for the existence of donuts or slivers (polygons may not cover the entire AOA extent). Zoom into an area and visually compare the outputs of each feature class by identifying all layers for a few points using the Identify tool. Verify the following values:
4. If using PAD-US as the tool input, the Owner/Governance Type (Own_Type) value for the COW output feature class should equal the Owner Type value in the PADUS tool input feature class. Otherwise, the values of the attribute containing Ownership/Governance values should match between the local tool input features and the output features.
5. If using WDPA as the tool input, the Owner/Governance Type (Owner) value for the output feature class should equal the Owner Type value in the WDPA tool input feature class. Otherwise, the values of the attribute containing Ownership/Governance values should match between the local tool input features and the output features.
6. If using MPA as the tool input, the Owner/Governance Type (Gov_Level by default) value COW for the output feature class should equal the Owner Type value in the MPA tool input feature class. Otherwise, the values of the attribute containing Ownership/Governance values should match between the local tool input features and the output features.
7. If using PAD-US as the tool input, the GAP Status Code (GAP_Sts) value for the COW output feature class should equal the GAP Status Code value in the PADUS tool input feature class. Otherwise, the values of the attribute containing the Protected Area values should match between the tool input features and the output features.
8. If using WDPA or MPA as the tool input, the Gov_Level value for the CAP output feature class should equal the GAP Status Code value in the PADUS tool input feature class. Otherwise, the

values of the attribute containing the Protected Area values should match between the tool input features and the output features.

Verify statistics output

1. Open each statistics table and compare them to verify that the AOA_FEATURE_AREA_SQKM values are equivalent across all of the tables. Sort the PCT_AREA field in descending order and look for outliers (zero or negative values, more than one value near 100; value greater than 100).
2. Select one record from each statistics table and double-check the result column values by re-calculating them by hand:
3. Select one record from each statistics table and double-check the result column values by re-calculating it by hand:

PCT_AREA = (AREA_SQKM / AOA_FEATURE_AREA_SQKM) * 100

Interpretation Tips

Ownership/Governance Statistics (COW) attributes:

OWNER TYPE or OWNER or GOV_LEVEL	Name of owner/governance entity from input dataset
FREQUENCY	Number of polygon features for owner/governance type
TOTAL_AOA_AREA_SQKM	Total area of the AOA in km^2, calculated from **all** polygon features
AOA_FEATURE_AREA_SQKM	Total area of the AOA in km^2, calculated from polygon feature
AREA_SQKM	Class area in km^2, calculated from the sum of features for owner/governance type
PCT_AREA	Percent area of owner/governance type (AREA_SQKM/ AOA_FEATURE_AREA_SQKM) * 100
AOA_NAME	AOA name from AOA Identifier tool parameter concatenated with AOA Field value

Protected Area (CAP) Statistics attributes:

GAP STATUS CODE (PADUS only)	Protected Area status (from GAP); only present in statistics tables generated from PADUS tool input
FREQUENCY	Number of polygon features for protected area status
TOTAL_AOA_AREA_SQKM	Total area of the AOA in km^2, calculated from **all** polygon features
AOA_FEATURE_AREA_SQKM	Total area of the AOA in km^2, calculated from polygon feature
AREA_SQKM	Class area in km^2, calculated from the sum of features for GAP status
PCT_AREA	Percent area of GAP status (AREA_SQKM/ AOA_FEATURE_AREA_SQKM) * 100
AOA_NAME	AOA name from AOA Identifier tool parameter concatenated with AOA Field value

Frequently Asked Questions

Can/should I use a different spatial reference?

Any NPScape spatial output can be re-projected to a 'final' local spatial reference. For vector outputs, Repair Geometry should be run after re-projection. This approach should be noted in explanatory or interpretive documentation to avoid misleading the user; re-projection of an output dataset will have no effect on area attributes in the summary table generated by the NPScape script.

All NPScape tools generate area calculations from input data. If tool input data must be re-projected prior to running the tools, care should be taken to use a local spatial reference that distorts area minimally, such as an equal-area projection. For CONUS and Caribbean tool input datasets, NPScape uses USA Contiguous Albers Equal Area Conic USGS (NAD_83) as the spatial reference. Alaska-specific tool input

datasets are in Alaska Albers Equal Area Conic (NAD_83) while Hawaii-specific datasets use UTM Zone 5N (NAD_83). UTM WGS84 Zone 55N is used for Saipan and Guam while UTN NAD83 Zone 2S is used for American Samoa.

Re-projecting vector input data:
NPScape tool input vector data can be re-projected prior to use as a tool input. The source dataset should be clipped to an extent larger than the intended area of analysis. Then, after clipping, Repair Geometry must be run to correct geometric errors. Finally, the clipped input can be re-projected to the local spatial reference, followed again with a Repair Geometry operation.

I'm having trouble downloading the tool input dataset. Is there another way to get it?

Many tool input datasets are very large. Please contact the NPScape team to request a custom delivery and/or a custom clipped extent: mailto:NRSS_NRPC_NPScape@nps.gov

My outputs don't show up in my map. What can I do?

The tools use ArcGIS display layers to visualize the metric outputs. If you see a red **!** by the layer name in the map, the layer can't find the feature class or raster to which it is linked. The most common reason is that the Output Geodatabase Name parameter differed from what the tool script expected. Fix the problem by clicking the red **!** and navigating to the output geodatabase. Then, select the correct feature class or raster.

If a multi-feature singlepart AOA polygon was used, there will be an output raster or feature class and statistics table for each AOA feature, named with the value of the AOA Field attribute. However, only outputs for the last feature processed will be added to the map automatically. Add the remaining output rasters/feature classes and statistics tables. Use the *.lyr files in the ProcessedData subfolder to symbolize the features.

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Appendices

Appendix 1: Known issues

Data availability

The source dataset (PAD-US) is collected state-by-state and agency-by-agency. Therefore, variability in polygon features and attribution will occur across state or agency boundaries. One noticeable difference is when one state generated polygons for private land while the neighboring state did not. These areas will display as distinct divisions in output layers and maps.

The Marine Protected Areas Inventory dataset includes the continental U.S, the Caribbean, Alaska, and Hawaii.

Definition of Protected Area

For PADUS-sourced data, Protected Area is defined as any PAD-US v1.3 polygon with a GAP Status Code attribute value of '1 – managed for biodiversity – disturbance events proceed or a mimicked' or '2 – managed for biodiversity – disturbance events suppressed'. Polygons with these attributes are visually aggregated for display layers and their areas are added when PADUS_CAP statistics are calculated.

Local, non-PADUS tool input data may have different definitions of Protected Area and or ownership type.

All features within the WDPA dataset are considered protected areas.

Marine Protected Areas Statistics Values

Areas for MPA statistics are derived directly from the MPA polygons which may extend over a more generalized area than expected.

Sliver Polygons and Topological Errors

The initial release of the PAD-US v1.3 polygon feature class contained several sliver polygons, particularly in areas near NPS units. These slivers will alter statistical outputs slightly, resulting in records with very small PCT_AREA values.

Discrepancies between PAD-US, WDPA, and NPS Administrative Boundaries

The Protected Areas Database of the United States dataset includes NPS areas. These features came from the NPS Current Administrative Boundaries dataset and therefore may be out-of-date, may lack topology, or may have incorrect attribution. Updates provided by NPS groups in the Fall of 2010 are included in the PAD-US 1.3 feature class. See Appendix 4 for more details.

The World Database of Protected Areas dataset includes NPS areas. It is likely that these features came from the NPS Current Administrative Boundaries dataset and therefore may be out-of-date, may lack topology, or may have incorrect attribution. Note that updates done by NPS groups in the Fall of 2010 are NOT included in the WDPA database.

MPA and NPS Features

The Marine Protected Areas Inventory dataset does not distinguish coastal NPS areas from inland NPS areas. For example, the inland area of Olympic National Park is included in the MPA feature class in addition to the coastal parcels. It appears the stewards of the MPA Inventory used the full NPS feature class when including it in their dataset.

Duplicate Polygons for Certain WDPA Protected Areas

The source WDPA feature class contains replicated polygons for some protected areas. An example is the trans-border Glacier-Waterton area in Montana and Canada. Three polygons are attributed as Glacier National Park (two may be duplicates). Two polygons are attributed as Waterton (with one potential duplicate). These instances will result in inflated area calculations and potentially duplicated governance values for processed outputs.

Duplicate Polygon Features for MPA Areas

The source MPA dataset contains duplicate polygon features with different Prot_Lvl and/or Gov_Level attribute values. These duplicate features were retained in the feature class and may skew resulting statistics by counting the polygon area more than once (i.e. the polygon's area contributes to more than one protected area or governance category).

WDPA Spatial Integrity Issues

Every effort was made to retain the WDPA features as received from the source. The only spatial alteration made to the source was to run a Repair Geometry operation to remove significant errors in feature integrity. However, other spatial integrity issues exist that may arise from incorrect source projection information. An example of this issue is the presence of a protected area polygon from northwestern Colorado off the coast of South Carolina.

WDPA IUCN Categories

Modified from A. Granziera (pers. comm. 26 Oct. 2010): All protected areas included in the WDPA must meet the IUCN definition of protected areas. This is WDPA's first criterion for inclusion. However, it is important to note that the definition and the assignment of the category are de facto two different processes in many countries. When submitting data to the WDPA, most providers know whether or not the sites are protected areas according to IUCN definition, but they might not know which categories they belong to. A blank or 'not reported' IUCN category field means that no information about the IUCN category has been provided. A 'Not applicable' IUCN category field means that the site is internationally recognized and, therefore, IUCN categories do not formally apply.

Precision and Scale Settings for File Geodatabases

Fields used for calculating road densities have a float data type. In a file geodatabase, the float data type (single-precision floating point) does not allow explicit setting of precision and scale beyond the default precision setting of 6 digits (http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#//003n0000001m000000). Given the generally coarse resolution of tool input data for NPScape, this limitation was deemed acceptable.

Appendix 2: Using custom AOAs and/or local input data

Custom AOAs

The AOA feature class should include a text attribute with a name value for the AOA feature(s). The feature class can contain single or multi-part polygons. If single-part polygons are used, an output feature class and statistics table will be produced for each feature, named with the attribute value selected in the AOA_Field parameter.

Local input data
Local protected area data may be used in the Protected Areas Metric tool as long as a case field and selection statement matching local attributes can be used. The local protected areas feature class must match the spatial reference of the AOA feature class.

Appendix 3: Tool scripts

See Scripts subfolder for Python scripts used by the metric tool(s).

Appendix 4: Tool input data processing details - PADUS

Source data

Source 1: Protected Areas Database of the United States (version 1.3):
http://gapanalysis.usgs.gov/padus/data/download/

This polygon feature class includes protected area features for the United States. The source spatial reference was USA Contiguous Albers Equal Area Conic USGS, so PAD-US source data were not re-projected.

NPS boundary features were updated in the PAD-US 1.3 version. According the to PAD-US 1.2 version metadata file, these are the processing steps applied to NPS areas:
Data exported from PAD-US version 1.1 by "Owner Name = NPS" summarized by "Primary Designation Name" and distributed to NPS Networks for Category (Fee or Easement) and GAP Status Code review, coordinated by Bill Monahan (NPS Inventory and Monitoring) during the Fall 2010 in collaboration with GAP.

GAP obtained best available ownership data from NPS Land Resources Division (Roger Johnson). At the time, Lands had reviewed about 275 units and created tract level ownership data within the previously defined administrative (a.ka. legacy or proclomation) boundaries approved by congress. To aggreagate best available data without major topolgy overlap errors, GAP merged nps_tracts.shp with units from nps_boundary.pdf Lands had not yet revised to tracts. Both were reprojected and translated into the PADUS schema following Standards (see GAP Website).

With consent from the NPS Wilderness Stewardship Division (Ashley Adams), GAP incorporated nationally compiled NPS Wilderness Area data from Wilderness.net (Lisa Edison). GAP updated the combined nps_tracts_boundaries file with wilderness areas to avoid overlapping polygons and inflating protected area statistics. The Primary Designation Type and Name PADUS attributes describe the Wilderness Areas, while the Secondary Designation Type and Name fields describe the original designation present in NPS Lands files (e.g. National Park) where Wilderness Areas overlap.

GAP joined updated Lands data with the PADUS v1.1 NPScape review by the Primary Local Name field to transfer conservation measures. New protected areas were assigned categorical GAP Status Codes (see GAP Code Source = GAP - Default) and IUCN Categories. GAP incorporated a few protected areas in PAD-US version 1.1 reviewed by NPScape that are not in Lands data. Review comments are welcome. Where nps_tracts data was unavailable (i.e. GIS Source = nps_boundaries) GAP updated overlapping protected areas from PAD-US version 1.1 into legacy admin boundaries (e.g. state wildlife management areas) assuming land ownership in PADUS is accurate. Otherwise, nps_tracts data updated PAD-US after clipping polygons that crossed state lines to a state boundary file (USGS Gap Analysis Program 2011).

The protected area (PAD_CAP) metric (i.e. percent protected land) depends on the thematic identification of land management classes. GAP Status 1 or 2 categories represent management areas considered to be “protected” based on GAP criteria. They are derived from the GAP_Status_Code (GAP_Sts) attribute

in the PAD-US feature class. These two biodiversity management status ranks can generally be defined as follows (after Scott et al. 1993, Edwards et al. 1994, Crist et al. 1996):

GAP Status 1: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.

GAP Status 2: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.

The reclassification (or selection) is completed in an ArcGIS "select by attribute" operation and contain the following fields:
GAP Status Code = '1 – managed for biodiversity – disturbance events proceed or a mimicked' or GAP Status Code = '2 – managed for biodiversity – disturbance events suppressed'.

The Ownership/ Governance (COW) metric depends on the thematic identification of land Ownership Type classes (reported by land owner) as captured in the PAD-US 1.3 data set. The Ownership Type description includes actual Bureaus or Departments in the case of federal agencies, designation of the state or county ownership, and a breakdown of specific types of private ownership. The raw values in the Own_Type attribute of the PAD-US 1.3 feature class are used without alteration.

Processing steps – Summary

The source PAD-US feature class obtained in the standard NPScape projection. For CONUS areas, the PAD-US feature class is used without re-projection. For Alaska, Alaska Albers Equal Area Conic is used. NAD_83 is the datum for both projections. For Hawaii, UTM Zone 5N NAD83 is used.

Update schedule
Approximately every 2 years

Appendix 5: Tool input data processing details – WDPA

GIS data were obtained from the following sources:
Source 1: World Database of Protected Areas: http://www.wdpa.org
This polygon feature class includes protected area features across the globe. However, only protected area features within the US, Mexico, and Canada were used in the NPScape project.
Source 2: Area of Analysis Polygons

Processing steps - Summary

The source WDPA feature class was re-projected into a common spatial reference. For CONUS areas (including Puerto Rico and the Virgin Islands), the NPScape project uses USA Contiguous Albers Equal Area Conic USGS as its standard projection. For Alaska, Alaska Albers Equal Area Conic is used. NAD_83 is the datum for both projections. For Hawaii, UTM Zone 5N NAD83 is used.

Update schedule
Undetermined

Appendix 6: Tool input data processing details – MPA

Source 1: National Marine Protected Areas Center Marine Protected Areas Inventory:
http://mpa.gov/dataanalysis/mpainventory/
This polygon feature class includes marine protected area features from the U.S. including outlying islands. This version of the MPS Inventory contains geospatial boundaries for 1452 of the 1619 identified marine protected areas and is considered complete as of January 2010.
The feature class' native spatial reference is WGS84 (geographic).

Processing steps - Summary

Each source dataset was re-projected into a common spatial reference. For CONUS areas (including Puerto Rico and the Virgin Islands), the NPScape project uses USA Contiguous Albers Equal Area Conic USGS as its standard projection. For Alaska, Alaska Albers Equal Area Conic is used. NAD_83 is the datum for both projections. For Hawaii, UTM Zone 5N NAD83 is used.

Update schedule
Undetermined

Appendix 7: Metric data processing details (WDPA and MPA)

Source data
Tool inputs produced using steps in above appendices were symbololized by agency (governance) or ownership using ArcGIS layer files.

Update schedule
Undetermined